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Eastern Gondwana breakup and the Lord Howe Rise continental ribbon from multi-channel seismic reflection data

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The eastern Australian margin of Gondwana rifted during the Late Cretaceous, forming the Lord Howe Rise continental ribbon. This breakup is still poorly understood with only a few regional studies and suggested formation processes that range from a plume impinging on the lithosphere to upper-plate extension associated with slab rollback. This project uses data collected on a multi-leg geophysical cruise undertaken in 2016 to study the rifting processes at the Lord Howe Rise. This project uses a regional ∼900 km long east-west oriented profile at 27.2°S with both multi-channel seismic reflection and multibeam bathymetry datasets. We present processed pre-stack depth migrated seismic reflection images and interpretations to show the structure and evolution of this margin from the oceanic Tasman Basin in the west to the extended continental crust of the Lord Howe Rise in the east. The Tasman Basin contains buried basins only on its eastern side. These basins may be related to early transform faulting. The Lord Howe Rise contains both syn-rift and post-rift sedimentary sequences in multiple basins that record the breakup of the margin. Between these two regions are the Dampier Ridge and Middleton Basin. The boundary between the Dampier Ridge and Tasman Basin is a very sharp feature that is unlike any other boundary in the area. This sharp boundary may represent a transform segment. Within the Dampier Ridge, there are multiple rift basins up to 3 km deep that are similar to those on the Lord Howe Rise. In contrast, the Middleton Basin that separates the Dampier Ridge and the Lord Howe Rise is a broad, well-stratified sedimentary basin of up to ∼3.5 km thick and contains an unconformity that separates deeper sedimentary strata that are conformable with the basement and younger strata that filled the basin post-rifting. These new results indicate a dynamic process and history during the breakup of eastern Gondwana that led to the opening of the Tasman Basin and formation of the Lord Howe Rise continental ribbon.